Device for adjusting the angle of a component that can be rotated about a rotational axis, especially the arm rest in a vehicle

The invention relates to a device for adjusting the angle of a component that can be rotated about a rotational axis, especially an arm rest, in particular fastened to a seat and in particular to or in a vehicle. Devices of this type are known in general in order to carry out various functions, in particular in a motor vehicle: firstly, the component is to be able to be set in a more or less horizontal position in a manner such that it can easily be adjusted in accordance with the most comfortable or ergonomic position for a user; secondly, the component is also to be able to be set in a more or less vertical position of the component, or in a position arranged parallel to the backrest of the seat, so that space for use by the user can be kept free, for example at the side of the seat, and is not taken up by the component; furthermore, the positions set are to be protected as reliably as possible against unintentional changes in setting. The terms in "component" and "arm rest" are used largely synonymously below.

It is known in general to realize a more or less horizontal setting of the arm rest by a latching mechanism being provided with a plurality of intermeshing teeth, so that a certain number of different, discrete positions of the arm rest is possible. Devices of this type are to be designed such that they are as small and compact as possible, which also reduces the weight and the production costs. In order to provide the desired functionality - in

particular the provision of a comfort region, in which the arm rest is to be locked essentially horizontally and dependent on the direction of rotation, of an unlocking region, which is provided between this comfort region and an essentially vertical setting parallel to the backrest of a seat and in which the arm rest is to be able to be set in an essentially freely moveable manner and also back again into its lowermost position - automated solutions are known in general, in which in particular control contours interact with moveable elements in such a manner that the functionality is achieved. In this respect, constrained guides are known which have the disadvantage that elements which move or are moveable relative to one another sometimes strike "hard" against one another and, as a result, the more sensitive of such elements may break or become worn or lose their functionality in some other way.

The invention is therefore based on the object of developing a device for adjusting the angle of an arm rest in such a manner that the disadvantages of the prior art are avoided.

According to the invention, this object is achieved by a device for adjusting the angle of an arm rest that can be rotated about a rotational axis, the device having a first locking toothing and a rocking lever, the rocking lever being able to be set in a stable locking position and in a stable release position, the device having a third control element acting on the spring at least in one angular position of the component. This avoids the disadvantages of the prior

art because the rocking lever is not moved directly via the third control element, with the result that, even at such a location, no excessive wear or even a breaking of the rocking lever can take place, or these failures are very much more improbable. In this case, when changing the angular position of the component, a dynamic effect, starting from the third control element, is exerted on the spring, this dynamic effect bringing about the adjustment of the rocking lever from its release position into its locking position. There is therefore no direct transmission of force or no direct contact between the third control element and the rocking lever.

It is preferred that the device for setting the locking position and the release position of the rocking lever has a spring, in particular a snap-action spring which can be set into two stable positions. This has the advantage that the rocking lever can be set into its stable positions with very simple means. A spring of this type, in particular a snap-action spring or dead-center spring, is moreover comparatively lightweight and cost-effective and robust and durable over the entire service life of the device.

Furthermore, it is preferred that the device has a control device, the control device bringing about a direction-of-rotation-dependent lockability of the component as a function of the angular position of the arm rest. It is thereby possible in a simple manner to permit the arm rest to be able to be locked only in certain angular-position regions, for example in a

"comfort region" of the arm rest, which is provided in a more or less horizontal setting of the arm rest.

It is furthermore preferred that the first locking toothing is an internal toothing and the rocking lever has a second locking toothing forming an external toothing. A preferred device of this type can be constructed in a particularly simple and compact manner and with a comparatively low structural outlay and such that it can be used very comfortably by a user of the device or of the arm rest. Although this preferred embodiment with an internal toothing on the first locking toothing and an external toothing on the second locking toothing is exclusively dealt with below, a design the other way around, i.e. with an internally toothed rocking lever, is also possible according to the invention.

Furthermore, it is preferred that the first locking toothing is a peripheral internal toothing, and that the control device, externally toothed, is arranged such that it interacts with the first locking toothing. This enables a cost-effective production of the device according to the invention in a simple manner because the internal toothing of the first locking toothing can be designed such that it is largely entirely peripheral. Furthermore, this simplifies the installation of the device according to the invention and therefore makes it more cost-effective.

The invention furthermore relates to an arm rest and a seat which have a device according to the invention or are assigned thereto.

The invention is explained in more detail below with reference to exemplary embodiments illustrated in the drawing.

Figure 1 shows a diagrammatic illustration of the various angular-position regions or angular regions which are relevant to the setting of the arm rest.

Figures 2 to 7 show the device according to the invention in different settings or angular positions of the arm rest.

Figure 8 shows an exploded drawing of the device according to the invention.

Figure 1 illustrates an arm rest 2, which is arranged rotatably about a rotational axis 20, as an example of a component 2 or vehicle component 2. A device 10 connects the arm rest 2 to a seat 4 or to the backrest 4 of a seat. The seat 4, illustrated diagrammatically, can constitute, for example, the backrest of a seat or another device, in particular in the form of a component, for example of a motor vehicle. The terms "seat" 4 and "backrest" 4 are used largely synonymously below. In this case, the device 10 emits a plurality of settings or angular positions of the arm rest 2 relative to the backrest 4. The entire pivoting region A, which is determined by the device 10, of the arm rest 2 on the backrest 4 and about the rotational axis 20 is divided into:

a) a first angular region A1 which corresponds more or less to a horizontal setting of the arm rest 2 if it is

assumed that the backrest 4 is positioned essentially vertically, and

b) a second angular region A2 which is arranged at the "upper end" of the pivoting region A following the first angular region A1.

The first angular region A1, which is also referred to as the comfort region A1, extends here between an extreme angular position P0 and a second angular position P2 marking the boundary between the first angular region A1 and the second angular region A2. A first angular position P1 is situated in or on the first angular region A1. A further extreme angular position P3 is provided at the end of the second angular region A2, i.e. at its end facing away from the first angular region. The entire pivoting range of the arm rest 2 is marked in Figure 1 by the designation A. Furthermore, a first direction of rotation S1 in Figure 1 and in all of the following figures is provided as a rotation of the arm rest 2 in the direction "downward" from the further extreme angular position P3 to the extreme angular position P0 (this is clockwise in Figure 1 and counterclockwise in Figures 2 to 7), and a second direction of rotation S2 is provided for a rotation of the arm rest 2 counter to the direction of the first direction of rotation S1.

With spring means (not illustrated), provision can optionally be made according to the invention for the arm rest 2, at least in the second angular region A2, to be prestressed in the first direction of rotation S1, i.e. either a greater force is required in order to

move the arm rest 2, at least in the second angular region A2, into the second direction of rotation S2 and to move the arm rest 2 into the first direction of rotation S1, or else for the arm rest 2 to move automatically in the direction of the first direction of rotation S1.

The sequence of movement and the functioning of the device 10 according to the invention or of the arm rest 2 according to the invention is explained in more detail below with reference to Figures 2 to 8.

Figures 2 to 7 illustrate various setting positions or angular positions of the arm rest 2 together with the device 10 and its various components. In this case, for the sake of simplicity, the arm rest 2 is not shown in any of Figures 3 to 7, with it being possible to recognize the position or angular position of the arm rest 2 by the fact that an axial contour 22 is not rotationally symmetrical and the arm rest 2 is always arranged in a rotationally fixed manner with respect to the axial contour 22.

Figure 8 illustrates an exploded drawing of the device 10 according to the invention together with the arm rest 2, the rotational axis 20 and a first housing part 170 of the device 10, a second housing part 171 of the device 10 and installation means 172, in particular screws.

The various components of the device 10 according to the invention are introduced below in common for Figures 2 to 8. In the interior of the device 10 - as is apparent in particular from Figure 8 - the device 10

has a first locking toothing 131 which is fixed on a supporting element 130 and is provided as a preferably peripheral or continuous internal toothing of the supporting or retaining element 130.

A second locking toothing 141 of a rocking lever 140 interacts with the first locking toothing 131, with the rocking lever 140 being mounted rotatably or pivotably by means of a hole or recess (not specially designated by means of a designation) and by means of a pin 151 fastened to a rotational component 150. In this case, the pin 151 and the corresponding recess of the rocking lever 140 run parallel to the rotational axis 20, but offset parallel thereto, i.e. eccentrically. The rotational component 150, which is also designated the rotational element 150, has a recess corresponding to the axial contour 22 about the rotational axis 20, so that, after the axial contour 22 is inserted into the rotational component 150, the rotational component 150 is connected in a rotationally fixed manner to the rotational axis 20 or to the arm rest 2. A rotation of the arm rest 2 about the rotational axis 20 therefore brings about a rotation of the rotational element 150 which carries along the rocking lever 140. The rocking lever 140 is connected by means of a spring 145, which is designed in particular as a snap-action spring 145, i.e. as a dead-center spring, to the rotational element 150 or interacts with the latter in such a manner that the rocking lever 140 can be set into two stable positions, namely a stable locking position and a stable release position. The stable locking position of the rocking lever 140 corresponds here to the

position of the rocking lever 140 that is illustrated in Figures 2 to 4. The release position of the rocking lever 140 corresponds to the positions of the rocking lever 140 that are illustrated in Figures 5 to 7. In the locking position of the rocking lever 140, the second locking toothing 141 is in this case arranged further outward (with respect to the rotational axis 20), and, in the release position of the rocking lever 140, the further locking toothing 141 is arranged further inward, i.e. closer to the rotational axis 20. The rocking lever 140 is arranged in the plane of the retaining element 130, i.e. in the plane of the first locking toothing 131. Likewise arranged in this plane is at least part of a control device 120 which can be locked into the supporting element 130 or retaining element 130, for example by means of a clip-type latching 126 (cf. Figure 8). For this purpose, the control device 120 has, at least in a partial region, a toothing 125 which interacts with the first locking toothing 131, at least in partial regions of its circumference, and thereby connects the control device 120 to the retaining element 130 (in a rotationally fixed manner). Of course, the control device 120 and the retaining element 130 could also be produced in an integrated manner.

On that side of the retaining element 130 which lies opposite the control device 120, a further retaining element 160 is provided which has a recess 165 for receiving part of a locking spring 155, the locking spring having a fifth control element 154 which interacts with a sixth control element 153 of the

rotational component 150 and - as emerges particularly clearly from Figure 7 - brings about a locking of the rotational element 150 if the arm rest 2 is set in its further extreme position P3. The further retaining element 160 also serves, by means of friction elements 166, to provide a certain resistance to the movement of the arm rest 2 about the rotational axis 20. This is advantageous in so far as an unintentional adjustment of the arm rest 2, for example caused by up and down movements of the vehicle, for instance in the case of undulating terrain, is thereby prevented. As an alternative to the friction elements 166, provision may also be made for the arm rest 2 to be prestressed in the direction of the extreme position P0 by means of spring means (not illustrated).

The housing elements 171, 170, 172 are not illustrated in Figures 2 to 7 for the sake of simplicity.

The sequence of movement and the functioning of the device according to the invention or of the arm rest 2 according to the invention are explained in more detail with reference to Figures 2 to 7.

It is to be assumed in Figure 2 that the arm rest 2 is essentially in its extreme angular position P0 illustrated in Figure 1. In the extreme angular position P0, the rocking lever 140 is set in its locking position. This results in the engagement between the first locking toothing 131 (of the supporting element 130) and the second locking toothing 141 of the rocking lever 140. In this position, the arm rest 2 is locked in a manner dependent on the

direction of rotation. This means that although the arm rest 2 can be moved upward, i.e. in the second direction of rotation S2 (counter to a certain dynamic effect), the arm rest 2 is completely locked with respect to a movement in the direction of the first direction of rotation S1. If the arm rest 2 is moved in the direction of the second direction of rotation S2, i.e. "upward", the engagement of the locking toothings 131, 141 is initially canceled. However, the latter then snap into place again under the action of the spring 145 which prestresses the rocking lever 140 in the direction of its locking position, so that the locking toothings 131, 141 - displaced by at least one tooth - come into engagement again. In this manner, it is possible for the arm rest 2 to be lockable in accordance with the discrete latching positions, which are predetermined by the locking toothings 131, 141, in the comfort region, i.e. between the extreme angular position P0 and an arm rest 2, which is set upward by approximately 40°, i.e. in the direction of the second direction of rotation S2, in a manner dependent on the direction of rotation, i.e. although the arm rest 2 can be moved upward, it cannot be moved downward.

In Figure 4, the arm rest 2 is set in the second angular position in which a region 142 of the side 143, which lies opposite the second locking toothing 141, of the rocking lever 140, which is designed as a two-sided lever, is moved by a first control element 121 of the control device 120 in such a manner that the rocking lever 140 pivots over from its locking position into its release position, which is illustrated in Figure 5.

In Figure 5, the arm rest 2 is moved upward by approx. 50.5° in relation to its extreme angular position P0, i.e. in the second direction S2. In this position of the arm rest 2, the rocking lever 140 is set securely into its release position, i.e. the first control element 121 of the control device 120 has pressed that side 143 of the rocking lever 140 which lies opposite the second locking toothing 141 outward, i.e. away from the rotational axis 20, so that the other side of the rocking lever 140, on which the second locking toothing 141 is arranged, is pressed inward, i.e. toward the rotational axis 20, with the spring 145 being moved into a second snap-in position which corresponds to the release position of the rocking lever 140.

If the arm rest 2 is rotated further, as illustrated in Figure 6, it reaches an end stop in the further extreme angular position P3, for example rotated 124 degrees from the extreme angular position P0. In this case, that end 143 of the rocking lever 140 which is opposite the second locking toothing 141 strikes against a second control element 122 of the control device 120. The second control element 122 is designed in particular as a rectilinear stop for the end 143 of the rocking lever 140. The arm rest 2 is essentially freely rotatable between the second angular position P2 and the further extreme angular position P3, this free rotatability being restricted, if appropriate, by braking elements 166, which can be seen in Figure 8 and in Figure 7, and/or by a spring prestressing (not

illustrated) in the direction of the extreme angular position P0 of the arm rest 2.

Figure 7 also illustrates the retaining clip 155 together with the fifth control element 154.

If the arm rest 2 is rotated back again in the direction of the extreme angular position P0, the rocking lever 140, which is set into its release position, reaches, at approx. 12 degrees of rotation (upward in relation to the extreme angular position P0), a point or a position at which a third control element 123 (illustrated in Figure 3) of the control device 120 acts on the spring 145 and brings the latter to set the rocking lever 140 from its release position into its locking position. A fourth control element 124 of the control device 120 is illustrated in Figure 2. Its effect is, in the extreme angular position P0, to form a stop for the rotational component 150 or a stop element 152 fastened to the rotational component 150. After the engagement between the first locking toothing 131 and the second locking toothing 141 is produced in the extreme angular position P0 by the effect of the third control element 123, the arm rest 2 is again locked in a manner dependent on the direction of rotation and can be set in the comfort region between the extreme angular position P0 and the second angular position P2. It is thereby possible according to the invention for the arm rest 2 to be locked in a manner dependent on the direction of rotation without additional buttons, consequently automatically, in its comfort region, which corresponds to the first angular region A1, and to likewise be automatically unlocked if

the arm rest 2 is set beyond this comfort region into the second angular region A2. According to the invention, it is nót absolutely necessary to set the arm rest as far as its upper stop, i.e. as far as its further extreme angular position P3, in order to bring about an unlocking or the setting of the release position of the rocking lever 140. It is particularly advantageous that, during the transfer of the rocking lever 140 from its release position into its locking position, a control contour does not interact "hard" with the rocking lever 140 or with another actuating element, thus largely avoiding the probability of breakages or of material wear, in particular under dynamic effects. According to the invention, it is, however, also possible for the setting of the rocking lever 140 from its release position into its locking position to take place by the third control element 123 not merely interacting with the spring 145 but rather interacting directly with the rocking lever 140.

It is clear that provision is made according to the invention for the spring 145 to exert a sufficiently large force on the rocking lever such that, firstly, a bistable position of the rocking lever 140 is brought about in conjunction with the geometry of the rocking lever 140 and that, secondly, however, even during the ratchet function in the comfort region A1, a sufficiently high press-on force against the teeth of the first and second locking toothings 131, 141 is ensured.

List of Designations

2	Arm rest
4	Seat/backrest
10	Device
20	Rotational axis
22	Axial contour
120	Control device
121	First control element
122	Second control element
123	Third control element
124	Fourth control element
125	Toothing
126	Clip-type latching
130	Supporting element
131	First locking toothing
140	Rocking lever
141	Second locking toothing
143	Side/end of the rocking lever
145	Spring
150	Rotational component/rotational element
151	Pin
152	Stop element
153	Sixth control element
154	Fifth control element
155	Retaining clip
160	Further retaining element
165	Recess
166	Frictional element/braking element
170	First housing part
171	Second housing part
172	Installation means
A	Pivoting region
A1	First angular region
A2	Second angular region
P0	Extreme angular position
P1	First angular position
P2	Second angular position
P3	Further extreme angular position
S1	First direction of rotation
S2	Second direction of rotation